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SEQUENCE LISTING

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Armstrong, Christopher

<120> METHODS FOR IDENTIFYING AGENTS WHICH
ALTER HISTONE PROTEIN ACETYLATION, DECREASE AGING, INCREASE
LIFESPAN

<130> 0050.1618-000

<140> 09/461,580

<141> 1999-12-15

<160> 35

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 737

<212> PRT

<213> Mus musculus

<400> 1

Met Ala Asp Glu Val Ala Deu Ala Leu Gln Ala Ala Gly Ser Pro Ser
1 5 10 15
Ala Ala Ala Ala Met Glu Ala Ala Ser Gln Pro Ala Asp Glu Pro Leu
20 25 30
Arg Lys Arg Pro Arg Arg Asp Gly Pro Gly Leu Gly Arg Ser Pro Gly
35 40 45
Glu Pro Ser Ala Ala Val Ala Pro Ala Ala Ala Gly Cys Glu Ala Ala
50 55 60
Ser Ala Ala Ala Pro Ala Ala Leu Trp Arg Glu Ala Ala Gly Ala Ala
65 70 75 80
Ala Ser Ala Glu Arg Glu Ala Pro Ala Thr Ala Val Ala Gly Asp Gly
85 90 95
Asp Asn Gly Ser Gly Leu Arg Arg Glu Pro Arg Ala Ala Asp Asp Phe
100 105 110
Asp Asp Asp Glu Gly Glu Glu Glu Asp Glu Ala Ala Ala Ala Ala
115 120 125
Ala Ala Ala Ile Gly Tyr Arg Asp Asn Leu Leu Deu Thr Asp Gly Leu
130 135 140
Leu Thr Asn Gly Phe His Ser Cys Glu Ser Asp Asp Asp Arg Thr
145 150 155 160
Ser His Ala Ser Ser Ser Asp Trp Thr Pro Arg Pro Arg Ile Gly Pro
165 170 175
Tyr Thr Phe Val Gln Gln His Leu Met Ile Gly Thr Asp Pro Arg Thr
180 185 190
Ile Leu Lys Asp Leu Leu Pro Glu Thr Ile Pro Pro Pro Glu Leu Asp
195 200 205
Asp Met Thr Leu Trp Gln Ile Val Ile Asn Ile Leu Ser Glu Pro Pro
210 215 220

Lys	Arg	Lys	Lys	Arg	Lys	Asp	Ile	Asn	Thr	Ile	Glu	Asp	Ala	Val	Lys
225					230					235					240
Leu	Leu	Gln	Glu	Cys	Lys	Lys	Ile	Ile	Val	Leu	Thr	Gly	Ala	Gly	Val
				245					250					255	
Ser	Val	Ser	Cys	Gly	Ile	Pro	Asp	Phe	Arg	Ser	Arg	Asp	Gly	Ile	Tyr
			260					265					270		
Ala	Arg	Leu	Ala	Val	Asp	Phe	Pro	Asp	Leu	Pro	Asp	Pro	Gln	Ala	Met
		275					280					285			
Phe	Asp	Ile	Glu	Tyr	Phe	Arg	Lys	Asp	Pro	Arg	Pro	Phe	Phe	Lys	Phe
290						295					300				
Ala	Lys	Glu	Ile	Tyr	Pro	Gly	Gln	Phe	Gln	Pro	Ser	Leu	Cys	His	Lys
305					310					315					320
Phe	Ile	Ala	Leu	Ser	Asp	Lys	Glu	Gly	Lys	Leu	Leu	Arg	Asn	Tyr	Thr
				325					330					335	
Gln	Asn	Ile	Asp	Thr	Leu	Glu	Gln	Val	Ala	Gly	Ile	Gln	Arg	Ile	Leu
			340					345					350		
Gln	Cys	His	Gly	Ser	Phe	Ala	Thr	Ala	Ser	Cys	Leu	Ile	Cys	Lys	Tyr
		355					360					365			
Lys	Val	Asp	Cys	Glu	Ala	Val	Arg	Gly	Asp	Ile	Phe	Asn	Gln	Val	Val
370						375					380				
Pro	Arg	Cys	Pro	Arg	Cys	Pro	Ala	Asp	Glu	Pro	Leu	Ala	Ile	Met	Lys
385					390					395					400
Pro	Glu	Ile	Val	Phe	Phe	Gly	Glu	Asn	Leu	Pro	Glu	Gln	Phe	His	Arg
				405				410						415	
Ala	Met	Lys	Tyr	Asp	Lys	Asp	Glu	Val	Asp	Leu	Leu	Ile	Val	Ile	Gly
			420				425						430		
Ser	Ser	Leu	Lys	Val	Arg	Pro	Val	Ala	Leu	Ile	Pro	Ser	Ser	Ile	Pro
		435					440					445			
His	Glu	Val	Pro	Gln	Ile	Leu	Ile	Asn	Arg	Glu	Pro	Leu	Pro	His	Leu
		450				455					460				
His	Phe	Asp	Val	Glu	Leu	Leu	Gly	Asp	Cys	Asp	Val	Ile	Ile	Asn	Glu
465					470					475					480
Leu	Cys	His	Arg	Leu	Gly	Gly	Glu	Tyr	Ala	Lys	Leu	Cys	Cys	Asn	Pro
				485					490					495	
Val	Lys	Leu	Ser	Glu	Ile	Thr	Glu	Lys	Pro	Pro	Arg	Pro	Gln	Lys	Glu
			500					505					510		
Leu	Val	His	Leu	Ser	Glu	Leu	Pro	Pro	Thr	Pro	Leu	His	Ile	Ser	Glu
		515					520					525			
Asp	Ser	Ser	Ser	Pro	Glu	Arg	Thr	Val	Pro	Gln	Asp	Ser	Ser	Val	Ile
	530					535					540				
Ala	Thr	Leu	Val	Asp	Gln	Ala	Thr	Asn	Asn	Asn	Val	Asn	Asp	Leu	Glu
545					550					555					560
Val	Ser	Glu	Ser	Ser	Cys	Val	Glu	Glu	Lys	Pro	Gln	Glu	Val	Gln	Thr
				565					570					575	
Ser	Arg	Asn	Val	Glu	Asn	Ile	Asn	Val	Glu	Asn	Pro	Asp	Phe	Lys	Ala
			580					585					590		
Val	Gly	Ser	Ser	Thr	Ala	Asp	Lys	Asn	Glu	Arg	Thr	Ser	Val	Ala	Glu
		595					600					605			
Thr	Val	Arg	Lys	Cys	Trp	Pro	Asn	Arg	Leu	Ala	Lys	Glu	Gln	Ile	Ser
	610					615					620				
Lys	Arg	Leu	Glu	Gly	Asn	Gln	Tyr	Leu	Phe	Val	Pro	Pro	Asn	Arg	Tyr
625					630					635					640
Ile	Phe	His	Gly	Ala	Glu	Val	Tyr	Ser	Asp	Ser	Glu	Asp	Asp	Val	Leu
				645					650					655	

```

Ser Ser Ser Ser Cys Gly Ser Asn Ser Asp Ser Gly Thr Cys Gln Ser
      660      665      670
Pro Ser Leu Glu Glu Pro Leu Glu Asp Glu Ser Glu Ile Glu Glu Phe
      675      680      685
Tyr Asn Gly Leu Glu Asp Asp Thr Glu Arg Pro Glu Cys Ala Gly Gly
      690      695      700
Ser Gly Phe Gly Ala Asp Gly Gly Asp Gln Glu Val Val Asn Glu Ala
705      710      715      720
Ile Ala Thr Arg Gln Glu Leu Thr Asp Val Asn Tyr Pro Ser Asp Lys
      725      730      735
Ser

```

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<210> 2
<211> 272
<212> PRT
<213> Saccharomyces cerevisiae

```

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<400> 2
Ile Asn Lys Val Leu Cys Thr Arg Leu Arg Leu Ser Asn Phe Phe Thr
 1      5      10      15
Ile Asp His Phe Ile Gln Lys Leu His Thr Ala Arg Lys Ile Leu Val
      20      25      30
Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp Phe Arg
      35      40      45
Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly Leu Asp Asp
      50      55      60
Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp Pro Ser Val
      65      70      75      80
Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys Ile Tyr Ser
      85      90      95
Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly Lys Leu Leu
      100      105      110
Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala Gly Ile
      115      120      125
Ser Thr Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr Ala Thr
      130      135      140
Cys Val Thr Cys His Trp Asn Leu Pro Gly Glu Arg Ile Phe Asn Lys
      145      150      155      160
Ile Arg Asn Leu Glu Leu Pro Leu Cys Pro Tyr Cys Tyr Lys Lys Arg
      165      170      175
Arg Glu Tyr Phe Pro Glu Gly Tyr Asn Asn Lys Val Gly Val Ala Ala
      180      185      190
Ser Gln Gly Ser Met Ser Glu Arg Pro Pro Tyr Ile Leu Asn Ser Tyr
      195      200      205
Gly Val Leu Lys Pro Asp Ile Thr Phe Phe Gly Glu Ala Leu Pro Asn
      210      215      220
Lys Phe His Lys Ser Ile Arg Glu Asp Ile Leu Glu Cys Asp Leu Leu
      225      230      235      240
Ile Cys Ile Gly Thr Ser Leu Lys Val Ala Pro Val Ser Glu Ile Val
      245      250      255
Asn Met Val Pro Ser His Val Pro Gln Val Leu Ile Asn Arg Asp Pro
      260      265      270

```

<210> 3
 <211> 267
 <212> PRT
 <213> *Saccharomyces cerevisiae*

<400> 3
 Ile Asn Lys Val Leu Ser Thr Arg Leu Arg Leu Pro Asn Phe Asn Thr
 1 5 10 15
 Ile Asp His Phe Thr Ala Thr Leu Arg Asn Ala Lys Lys Ile Leu Val
 20 25 30
 Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp Phe Arg
 35 40 45
 Ser Ser Glu Gly Phe Tyr Ser Lys Ile Arg His Leu Gly Leu Glu Asp
 50 55 60
 Pro Gln Asp Val Phe Asn Leu Asp Ile Phe Leu Gln Asp Pro Ser Val
 65 70 75 80
 Phe Tyr Asn Ile Ala His Met Val Leu Pro Pro Glu Asn Met Tyr Ser
 85 90 95
 Pro Leu His Ser Phe Ile Lys Met Leu Gln Asp Lys Gly Lys Leu Leu
 100 105 110
 Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala Gly Ile
 115 120 125
 Asp Pro Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr Ala Ser
 130 135 140
 Cys Val Thr Cys His Trp Gln Ile Pro Gly Glu Lys Ile Phe Glu Asn
 145 150 155 160
 Ile Arg Asn Leu Glu Leu Pro Leu Cys Pro Tyr Cys Tyr Gln Lys Arg
 165 170 175
 Lys Gln Tyr Phe Pro Met Ser Asn Gly Asn Asn Thr Val Gln Thr Asn
 180 185 190
 Ile Asn Phe Asn Ser Pro Ile Leu Lys Ser Tyr Gly Val Leu Lys Pro
 195 200 205
 Asp Met Thr Phe Phe Gly Glu Ala Leu Pro Ser Arg Phe His Lys Thr
 210 215 220
 Ile Arg Lys Asp Ile Leu Glu Cys Asp Leu Leu Ile Cys Ile Gly Thr
 225 230 235 240
 Ser Leu Lys Val Ala Pro Val Ser Glu Ile Val Asn Met Val Pro Ser
 245 250 255
 His Val Pro Gln Ile Leu Ile Asn Arg Asp Met
 260 265

<210> 4
 <211> 245
 <212> PRT
 <213> *Mus musculus*

<400> 4
 Val Ile Asn Ile Leu Ser Glu Pro Pro Lys Arg Lys Lys Arg Lys Asp
 1 5 10 15
 Ile Asn Thr Ile Glu Asp Ala Val Lys Leu Leu Gln Glu Cys Lys Lys
 20 25 30
 Ile Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro
 35 40 45

```

Asp Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe
 50          55          60
Pro Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg
65          70          75          80
Lys Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly
          85          90          95
Gln Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys
          100          105          110
Glu Gly Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Thr Leu Glu
          115          120          125
Gln Val Ala Gly Ile Gln Arg Ile Leu Gln Cys His Gly Ser Phe Ala
          130          135          140
Thr Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp Cys Glu Ala Val
145          150          155          160
Arg Gly Asp Ile Phe Asn Gln Val Val Pro Arg Cys Pro Arg Cys Pro
          165          170          175
Ala Asp Glu Pro Leu Ala Ile Met Lys Pro Glu Ile Val Phe Phe Gly
          180          185          190
Glu Asn Leu Pro Glu Gln Phe His Arg Ala Met Lys Tyr Asp Lys Asp
          195          200          205
Glu Val Asp Leu Leu Ile Val Ile Gly Ser Ser Leu Lys Val Arg Pro
          210          215          220
Val Ala Leu Ile Pro Ser Ser Ile Pro His Glu Val Pro Gln Ile Leu
225          230          235          240
Ile Asn Arg Glu Pro
          245

```

<210> 5

<211> 237

<212> PRT

<213> Escherichia coli

<400> 5

```

Met Met Glu Asn Pro Arg Val Leu Val Leu Thr Gly Ala Gly Ile Ser
 1          5          10          15
Ala Glu Ser Gly Ile Arg Thr Phe Arg Ala Ala Asp Gly Leu Trp Glu
          20          25          30
Glu His Arg Val Glu Asp Val Ala Thr Pro Glu Gly Phe Ala Arg Asn
          35          40          45
Pro Gly Leu Val Gln Thr Phe Tyr Asn Ala Arg Arg Gln Gln Leu Gln
          50          55          60
Gln Pro Glu Ile Gln Pro Asn Ala Ala His Leu Ala Leu Ala Asn Leu
65          70          75          80
Lys Lys Arg Leu Ala Ile Ala Phe Leu Leu Val Thr Gln Asn Ile Asp
          85          90          95
Asn Leu His Glu Arg Ala Gly Asn Arg Asn Ile Ile Gln Met His Gly
          100          105          110
Glu Leu Leu Lys Val Arg Cys Ser Gln Ser Gly Gln Ile Leu Glu Trp
          115          120          125
Asn Gly Asp Val Met Pro Glu Asp Lys Cys His Cys Cys Gln Phe Pro
          130          135          140
Ala Pro Leu Arg Pro His Val Val Trp Phe Gly Glu Met Pro Leu Gly
145          150          155          160

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Met	Asp	Glu	Ile	Tyr	Met	Ala	Leu	Ser	Met	Ala	Asp	Ile	Phe	Ile	Ala
				165					170					175	
Ile	Gly	Thr	Ser	Gly	His	Val	Tyr	Pro	Ala	Ala	Gly	Phe	Val	His	Glu
			180					185					190		
Ala	Lys	Leu	His	Gly	Ala	His	Thr	Val	Glu	Leu	Asn	Leu	Glu	Pro	Ser
		195					200					205			
Gln	Val	Gly	Asn	Glu	Phe	Glu	Glu	Lys	His	Tyr	Gly	Pro	Ala	Ser	Gln
	210					215					220				
Val	Val	Pro	Glu	Phe	Val	Asp	Lys	Phe	Leu	Lys	Gly	Leu			
225					230					235					

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<210> 6
<211> 21
<212> PRT
<213> Artificial Sequence
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<220>
<223> Synthetic Peptide

```
<400> 6
Ala Arg Thr Lys Gln Thr Ala Arg Lys Ser Thr Gly Gly Lys Ala Pro
 1          5          10          15
Arg Lys Gln Leu Cys
      20
```

```
<210> 7
<211> 20
<212> PRT
<213> Artificial Sequence
```

<220>
<223> Synthetic Peptide

```
<400> 7
Ser Gly Arg Gly Lys Gly Gly Lys Gly Leu Gly Lys Gly Gly Ala Lys
 1          5          10          15
Arg His Arg Cys
      20
```

```
<210> 8
<211> 19
<212> PRT
<213> Artificial Sequence
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<220>
<223> Synthetic Peptide

```
<400> 8
Ala Gly Gly Lys Gly Gly Lys Gly Met Gly Lys Val Gly Ala Lys Arg
  1             5             10             15
His Ser Cys
```

<210> 9
 <211> 128
 <212> PRT
 <213> Mus musculus

```

<400> 9
Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro Asp
 1          5          10          15
Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe Pro
          20          25          30
Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg Lys
          35          40          45
Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly Gln
          50          55          60
Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys Glu
65          70          75          80
Gly Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Thr Leu Glu Gln
          85          90          95
Val Ala Gly Ile Gln Arg Ile Leu Gln Cys His Gly Ser Phe Ala Thr
          100          105          110
Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp Cys Glu Ala Val Arg
          115          120          125

```

<210> 10
 <211> 128
 <212> PRT
 <213> Saccharomyces cerevisiae

```

<400> 10
Leu Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp
 1          5          10          15
Phe Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly Leu
          20          25          30
Asp Asp Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp Pro
          35          40          45
Ser Val Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys Ile
          50          55          60
Tyr Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly Lys
65          70          75          80
Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala
          85          90          95
Gly Ile Ser Thr Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr
          100          105          110
Ala Thr Cys Val Thr Cys His Trp Asn Leu Pro Gly Glu Arg Ile Phe
          115          120          125

```

<210> 11
 <211> 336
 <212> PRT
 <213> Saccharomyces cerevisiae

<400> 11

```

Ala Ile Asn Lys Val Leu Cys Thr Arg Leu Arg Leu Ser Asn Phe Phe
 1           5           10           15
Thr Ile Asp His Phe Ile Gln Lys Leu His Thr Ala Arg Lys Ile Leu
          20           25           30
Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp Phe
          35           40           45
Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly Leu Asp
          50           55           60
Asp Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp Pro Ser
65           70           75           80
Val Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys Ile Tyr
          85           90           95
Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly Lys Leu
          100          105          110
Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala Gly
          115          120          125
Ile Ser Thr Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr Ala
          130          135          140
Thr Cys Val Thr Cys His Trp Asn Leu Pro Gly Glu Arg Ile Phe Asn
145           150           155           160
Lys Ile Arg Asn Leu Glu Leu Pro Leu Cys Pro Tyr Cys Tyr Lys Lys
          165          170          175
Arg Arg Glu Tyr Phe Pro Glu Gly Tyr Asn Asn Lys Val Gly Val Ala
          180          185          190
Ala Ser Gln Gly Ser Met Ser Glu Arg Pro Pro Tyr Ile Leu Asn Ser
          195          200          205
Tyr Gly Val Leu Lys Pro Asp Ile Thr Phe Phe Gly Glu Ala Leu Pro
          210          215          220
Asn Lys Phe His Lys Ser Ile Arg Glu Asp Ile Leu Glu Cys Asp Leu
225           230           235           240
Leu Ile Cys Ile Gly Thr Ser Leu Lys Val Ala Pro Val Ser Glu Ile
          245          250          255
Val Asn Met Val Pro Ser His Val Pro Gln Val Leu Ile Asn Arg Asp
          260          265          270
Pro Val Lys His Ala Glu Phe Asp Leu Ser Leu Leu Gly Tyr Cys Asp
          275          280          285
Asp Ile Ala Ala Met Val Ala Gln Lys Cys Gly Trp Thr Ile Pro His
          290          295          300
Lys Lys Trp Asn Asp Leu Lys Asn Lys Asn Phe Lys Cys Gln Glu Lys
305           310           315           320
Asp Lys Gly Val Tyr Val Val Thr Ser Asp Glu His Pro Lys Thr Leu
          325          330          335

```

<210> 12

<211> 327

<212> PRT

<213> Mus musculus

<400> 12

```

Val Ile Asn Ile Leu Ser Glu Pro Pro Lys Arg Lys Lys Arg Lys Asp
 1           5           10           15
Ile Asn Thr Ile Glu Asp Ala Val Lys Leu Leu Gln Glu Cys Lys Lys
          20           25           30

```



```

Ile Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro
   35           40           45
Asp Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe
   50           55           60
Pro Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg
   65           70           75           80
Lys Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly
           85           90           95
Gln Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys
           100          105          110
Glu Gly Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Thr Leu Glu
           115          120          125
Gln Val Ala Gly Ile Gln Arg Ile Leu Gln Cys His Gly Ser Phe Ala
           130          135          140
Thr Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp Cys Glu Ala Val
   145           150          155          160
Arg Gly Asp Ile Phe Asn Gln Val Val Pro Arg Cys Pro Arg Cys Pro
           165          170          175
Ala Asp Glu Pro Leu Ala Ile Met Lys Pro Glu Ile Val Phe Phe Gly
           180          185          190
Glu Asn Leu Pro Glu Gln Phe His Arg Ala Met Lys Tyr Asp Lys Asp
           195          200          205
Glu Val Asp Leu Leu Ile Val Ile Gly Ser Ser Leu Lys Val Arg Pro
           210          215          220
Val Ala Leu Ile Pro Ser Ser Ile Pro His Glu Val Pro Gln Ile Leu
   225           230          235          240
Ile Asn Arg Glu Pro Leu Pro His Leu His Phe Asp Val Glu Leu Leu
           245          250          255
Gly Asp Cys Asp Val Ile Ile Asn Glu Leu Cys His Arg Leu Gly Gly
           260          265          270
Glu Tyr Ala Lys Leu Cys Cys Asn Pro Val Lys Leu Ser Glu Ile Thr
           275          280          285
Glu Lys Pro Pro Arg Pro Gln Lys Glu Leu Val His Leu Ser Glu Leu
           290          295          300
Pro Pro Thr Pro Leu His Ile Ser Glu Asp Ser Ser Ser Pro Glu Arg
   305           310          315          320
Thr Val Pro Gln Asp Ser Ser
           325

```

<210> 13

<211> 237

<212> PRT

<213> Escherichia coli

<400> 13

```

Met Met Glu Asn Pro Arg Val Leu Val Leu Thr Gly Ala Gly Ile Ser
   1           5           10          15
Ala Glu Ser Gly Ile Arg Thr Phe Arg Ala Ala Asp Gly Leu Trp Glu
           20           25           30
Glu His Arg Val Glu Asp Val Ala Thr Pro Glu Gly Pro Ala Arg Asn
           35           40           45
Pro Gly Leu Val Gln Thr Phe Tyr Asn Ala Arg Arg Gln Gln Leu Gln
           50           55           60

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Gln Pro Glu Ile Gln Pro Asn Ala Ala His Leu Ala Leu Ala Asn Leu
65 70 75 80
Lys Lys Arg Leu Ala Ile Ala Phe Leu Leu Val Thr Gln Asn Ile Asp
85 90 95
Asn Leu His Glu Arg Ala Gly Asn Arg Asn Ile Ile Gln Met His Gly
100 105 110
Glu Leu Leu Lys Val Arg Cys Ser Gln Ser Gly Gln Ile Leu Glu Trp
115 120 125
Asn Gly Asp Val Met Pro Glu Asp Lys Cys His Cys Cys Gln Phe Pro
130 135 140
Ala Pro Leu Arg Pro His Val Val Trp Phe Gly Glu Met Pro Leu Gly
145 150 155 160
Met Asp Glu Ile Tyr Met Ala Leu Ser Met Ala Asp Ile Phe Ile Ala
165 170 175
Ile Gly Thr Ser Gly His Val Tyr Pro Ala Ala Gly Phe Val His Glu
180 185 190
Ala Lys Leu His Gly Ala His Thr Val Glu Leu Asn Leu Glu Pro Ser
195 200 205
Gln Val Gly Asn Glu Phe Glu Glu Lys His Tyr Gly Pro Ala Ser Gln
210 215 220
Val Val Pro Glu Phe Val Asp Lys Phe Leu Lys Gly Leu
225 230 235

<210> 14
<211> 106
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 14
Ile Leu Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly
20 25 30
Leu Asp Asp Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp
35 40 45
Pro Ser Val Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys
50 55 60
Ile Tyr Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly
65 70 75 80
Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr
85 90 95
Ala Gly Ile Ser Thr Asp Lys Leu Val Gln
100 105

<210> 15
<211> 106
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 15
Ile Leu Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro
1 5 10 15

Asp Phe Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Arg His Leu Gly
 20 25 30
 Leu Glu Asp Pro Gln Asp Val Phe Asn Leu Asp Ile Phe Leu Gln Asp
 35 40 45
 Pro Ser Val Phe Tyr Asn Ile Ala His Met Val Leu Pro Pro Glu Asn
 50 55 60
 Met Tyr Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Asp Lys Gly
 65 70 75 80
 Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr
 85 90 95
 Ala Gly Ile Asp Pro Asp Lys Leu Val Gln
 100 105

<210> 16
 <211> 107
 <212> PRT
 <213> *Saccharomyces cerevisiae*

<400> 16
 Val Ile Phe Met Val Gly Ala Gly Ile Ser Thr Ser Cys Gly Ile Pro
 1 5 10 15
 Asp Phe Arg Ser Pro Gly Thr Gly Leu Tyr His Asn Leu Ala Arg Leu
 20 25 30
 Lys Leu Pro Tyr Pro Glu Ala Val Phe Asp Val Asp Phe Phe Gln Ser
 35 40 45
 Asp Pro Leu Pro Phe Tyr Thr Leu Ala Lys Glu Leu Tyr Pro Gly Asn
 50 55 60
 Phe Arg Pro Ser Lys Phe His Tyr Leu Leu Lys Leu Phe Gln Asp Lys
 65 70 75 80
 Asp Val Leu Lys Arg Val Tyr Thr Gln Asn Ile Asp Thr Leu Glu Arg
 85 90 95
 Gln Ala Gly Val Lys Asp Asp Leu Ile Ile Glu
 100 105

<210> 17
 <211> 131
 <212> PRT
 <213> *Saccharomyces cerevisiae*

<400> 17
 Ile Ala Cys Leu Thr Gly Ala Gly Ile Ser Cys Asn Ala Gly Ile Pro
 1 5 10 15
 Asp Phe Arg Ser Ser Asp Gly Leu Tyr Asp Leu Val Lys Lys Asp Cys
 20 25 30
 Ser Gln Tyr Trp Ser Ile Lys Ser Gly Arg Glu Met Phe Asp Ile Ser
 35 40 45
 Leu Phe Arg Asp Asp Phe Lys Ile Ser Ile Phe Ala Lys Phe Met Glu
 50 55 60
 Arg Leu Tyr Ser Asn Val Gln Leu Ala Lys Pro Thr Lys Thr His Lys
 65 70 75 80
 Phe Ile Ala His Leu Lys Asp Arg Asn Lys Leu Leu Arg Cys Tyr Thr
 85 90 95

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Gln Asn Ile Asp Gly Leu Glu Glu Ser Ile Gly Leu Thr Leu Ser Asn
100 105 110
Arg Lys Leu Pro Leu Thr Ser Phe Ser Ser His Trp Lys Asn Leu Asp
115 120 125
Val Val Gln
130

<210> 18
<211> 117
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 18
Met Val Val Val Ser Gly Ala Gly Ile Ser Val Ala Ala Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Glu Gly Ile Phe Ser Thr Val Asn Gly Gly Ser
20 25 30
Gly Lys Asp Leu Phe Asp Tyr Asn Arg Val Tyr Gly Asp Glu Ser Met
35 40 45
Ser Leu Lys Phe Asn Gln Leu Met Val Ser Leu Phe Arg Leu Ser Lys
50 55 60
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 Phe Lys Pro Thr Ile Cys His Tyr Phe Ile Arg Leu Leu Lys Glu Lys
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14/24

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Ala Lys Glu Ile Tyr Pro Gly Gln Phe Gln Pro Ser Leu Cys His Lys
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 Arg Leu Leu Lys Glu Lys Gly Leu Leu Leu Arg Cys Tyr Thr Gln Asn
 165 170 175
 Ile Asp Thr Leu Glu Arg Val Ala Gly Leu Glu Pro Gln Asp Leu Val
 180 185 190
 Glu Ala His Gly Thr Phe Tyr Thr Ser His Cys Val Asn Thr Ser Cys
 195 200 205
 Arg Lys Glu Tyr Thr Met Gly Trp Met Lys Glu Lys Ile Ser Gln Lys
 210 215 220
 Gln Leu Pro Gly Val Ser Ser Val
 225 230